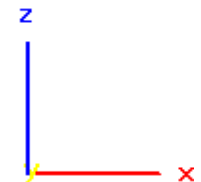
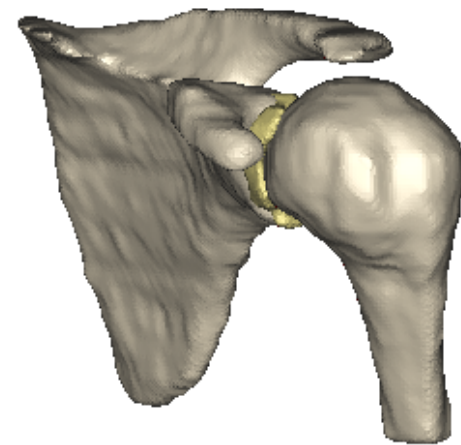
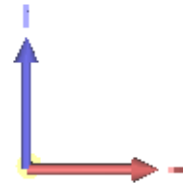
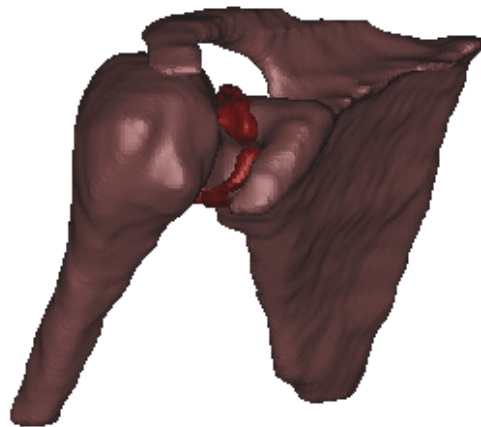


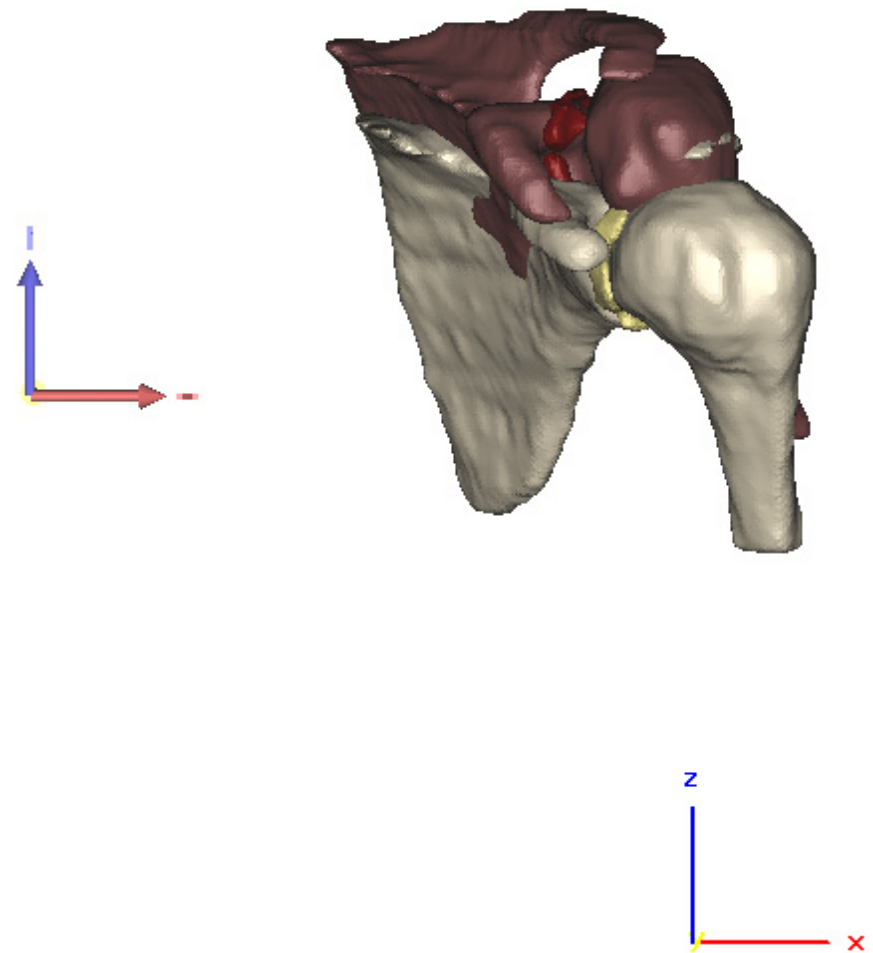
APPENDIX 1

Three-Dimensional Measurement of Glenoid Version Angle and Glenoid Declination Angle

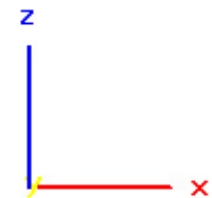
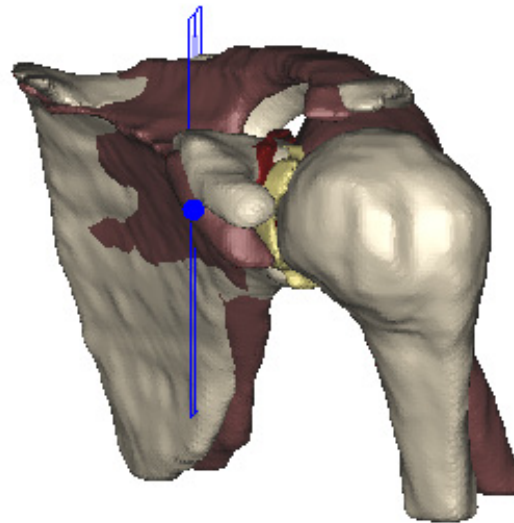
1. After creating 3D volume reformations of the scapula, glenoid labrum, and proximal humerus of both the affected (brown) and unaffected (beige) shoulder using Mimics® software (Materialise, Leuven, Belgium) as described in the methods section, import the structures into 3-matic® (Materialise, Leuven, Belgium).



2. Mirror the affected side onto the unaffected side (including humerus, scapula, and labrum).



3. Create the computer-calculated center of gravity and best fit plane of the unaffected scapula and translate all structures from the center of gravity of the unaffected scapula onto the origin of the coordinate plane.

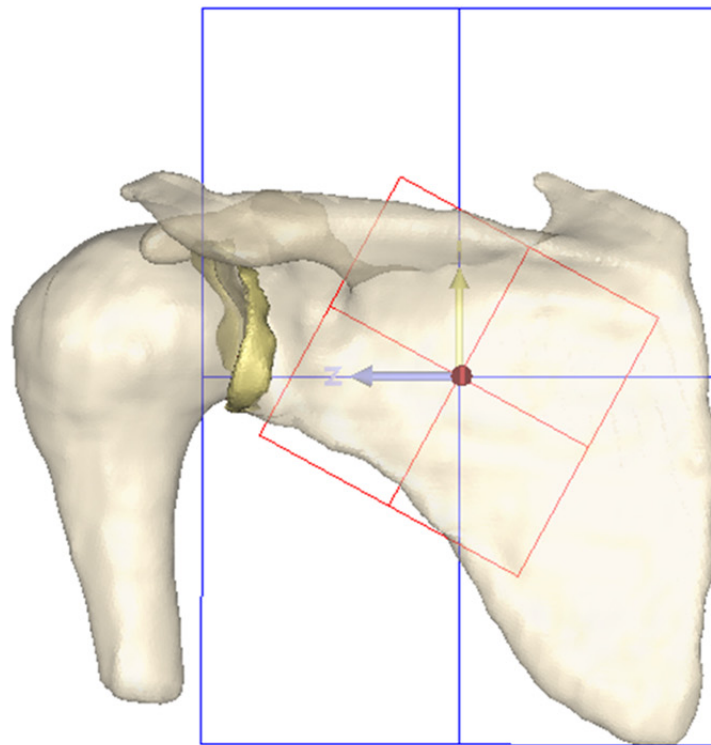


4. Rotate the coronal plane of the unaffected scapula onto the YZ coordinate plane and around the X axis in order to align the YZ coordinate plane with the medial border of the scapula. Move all structures along with the unaffected scapula. The scapular coronal plane should be perfectly aligned in the XY and XZ coordinate planes, with the scapula tilted in the YZ coordinate plane to align the medial border with the coordinate plane.

Coronal plane = YZ plane

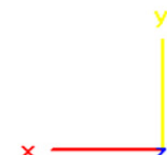
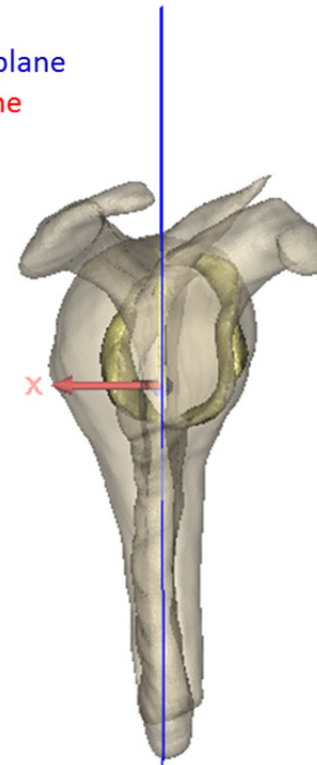
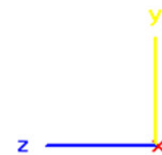
Sagittal plane = XY plane

Axial plane = XZ plane

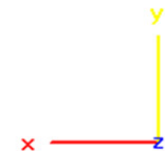
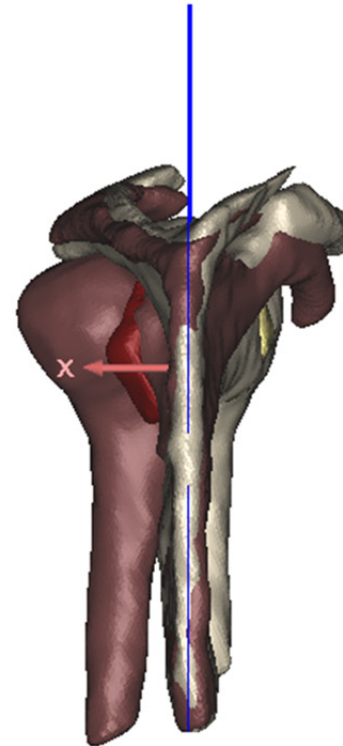
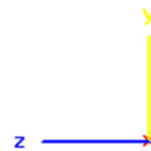


Blue = Coordinate plane

Red = Scapular plane



5. Translate and rotate the affected scapula onto the unaffected scapula until the medial borders are aligned and the best fit of the scapular bodies is achieved.



6. Create best fit planes at the center of gravity of both the unaffected and affected labra (red plane) and translate each labral plane to the origin (tilted blue plane) by its center of gravity.
7. Measure the glenoid declination angle as 90° minus the angle between the sagittal coordinate plane and the labral plane on both the unaffected and affected sides. Positive values represent glenoid declination (downward tilting).
8. Measure the glenoid version angle as 90° minus the angle between the coronal scapular plane and labral plane on the posterior side on both the unaffected and affected sides. Negative values represent glenoid retroversion (posterior tilting).

